[0200] When the image file for the surface of the specimen 30 is prepared, the growth degree of the HSGs with respect to the OCS-type capacitor cell 50 is automatically numerated. The numerical process is performed by the computer 36 with a built-in numerical program.

[0205] Two numerical algorithms, shown in Figs. 3 and 4, are proposed as embodiments of the present invention. In the first algorithm of Fig. 3, the program automatically selects the numerical target zone. In the second algorithm of Fig. 4, the operator selects the numerical target zone.

[0210] Fig. 3 is a flowchart showing a first numerical algorithm for numerating the growth degree of grains on the semiconductor wafer. Referring to Fig. 3, the operator executes a numerical program on a screen of the monitor 38. At step S10, if a numerical execution command is ordered, a menu for selecting a numerical recipe name on an initial screen is provided to thereby enable the operator to select a desired recipe name. The numerical recipe includes information such as a storage directory of image files to be numerated, an area and a position of the numerical target zone, a threshold value, and information on a directory in which the image files are to be re-stored. The operator selects an image file to be numerated among the recipe files. The computer 36 executes the numerical program in response to the operator's numerical execution command.

[0215] At step S12, once the numerical program is executed, the numerical program residing in a memory of the computer 36 reads out the image file to be numerated from memory, which is stored on a hard disk or any other suitable memory storage medium. Then, the image file is opened in order to perform a numerical process, and the following data process is performed.

[0220] The numerical process includes a batch processing routine for numerating

several image files simultaneously, or an individual processing routine for numerating one image file individually.

[0225] In the case of the batch processing, several image files to be numerated are stored in advance in a specific directory of the hard disk or other memory medium, and if necessary, the numerical process is commanded while designating the specific directory. Then, the computer sequentially opens several image files stored in the specific directory, performs the numerical process, and generates a numerical result for the respective image files.

[0230] In case of the individual processing, it is possible to perform the numerical process while designating the image files stored in the hard disk or other memory medium one by one. Also, the numerical process is directly performed in a state when the image files are temporarily stored in the memory, i.e., before the image files generated by the SEM are stored into the hard disk, thereby allowing for an intermediate examination of a manufacturing state. Then, when a satisfactory result is obtained, the image files and the numerical result are stored on the hard disk.

[0235] At step S14, after opening the image file, the numerical target zone for numerating the growth degree of grains among data of the image file is automatically selected. The image file generated by the SEM can be stored in various file formats. For example, the image data is may be compressed and stored in a tagged image file format (TIFF).

[0240] Fig. 5 is a view of an SEM image showing one OCS-type capacitor cell, more particularly, a view of an image showing an upper and lower portion of the OCS-type capacitor. The image was obtained by scanning the OCS-type capacitor cell when the tilt angle θ of the stage 28 was about 45 degrees. In the SEM image, the image's center-portion numerical target zone, i.e., the OCS-type capacitor cell, is

overlapped in the center of the image at the same magnification.

[0245] The automatic selection of the numerical target zone is performed through a mesh algorithm. The mesh algorithm is utilized to reduce calculation errors caused by a brightness deviation. In the mesh algorithm, the image is first divided with a certain spacing along the direction of the x-axis and y-axis, thereby obtaining a plurality of sub areas in a mesh form. In Fig. 5, the image is divided into 6 sections at intervals of 80 pixels along the x-axis and the y-axis using five mesh lines 64a-64e and another five mesh lines 66a-66e. Note that at this point of the process, the image division is not seen on the screen of the monitor 38, but the underlying data of the image file is indeed divided in the above-mentioned way.

[0250] After dividing the image file, a zone where a numerical calculation is to be performed, i.e., the data, is automatically selected. Although the numerical calculation can be performed with respect to the total image file, it is desirable to select a proper numerical target zone in order to accurately analyze the growth state of the HSG. As can be seen in Fig. 5, since the upper portion 68 of the image and the upper portion of the sidewalls 70 are not as bright as the lower portion of the sidewalls 70, the accuracy of the calculation is lowered. Accordingly, it is desirable that a format for increasing the accuracy of calculation should be implemented by selecting the numerical target zone so as to have a just a small difference in brightness. Accordingly, the numerical target zone is designated by the bold line shown in Fig. 5. The data corresponding to this area 62 is extracted from the image file using coordinate values. That is, the coordinate values corresponding to intersecting points of the mesh lines (64a and 66b, 64e and 66b, 64a and 66d, and 64e and 66d) are compared with coordinate values corresponding to the image data of respective pixels to thereby extract the image data of pixels disposed within the